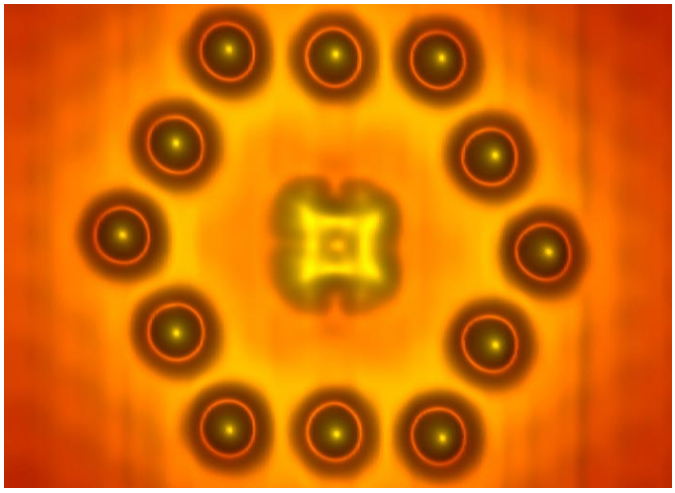
An international team of scientists from the US, Germany and Japan create what is possibly the smallest transistor ever-- one consisting of a single molecule and 12 atoms, reaching the very limit of Moore's law.



For the curious, the team used a highly stable scanning tunneling microscope (STM) to build the transistor out of a single molecule of phthalcocyanine and 12 positively charged indium atoms on an indium arsenide (InAs) crystal. The indium atoms act as electrical gates, allowing single atoms to hop over to change the charge state of the molecule.

As the scientists put it, "the molecule is only weakly bound to the InAs template. So, when we bring the STM tip very close to the molecule and apply a bias voltage to the tip-sample junction, single electrons can tunnel between template and tip by hopping via nearly unperturbed molecular orbitals, similar to the working principle of a quantum dot gated by an external electrode. In our case, the charged atoms nearby provide the electrostatic gate potential that regulates the electron flow and the charge state of the molecule."

Each indium atom is just 0.167nm wide, or far smaller than the 10nm and 7nm circuits recently shown by IBM and Intel. Interestingly, despite such tiny dimensions the team says such transistors are both reproducible and reliable, making them important in the bringing electronics to atomic scales.

Go Researchers Built a Transistor from a Molecule and a Few Atoms